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ADMIRAL MANNERS, President, in the Chair.

Charles Joseph Corbett, Esq., Imber Court, Thames Ditton;
Charles Lambert, Esq., Queen Street Place, Thames Street;
and
John Wood, Esq., Wharf College, near Tadcaster,

were balloted for and duly elected Fellows of the Society.

The November Meteors, 1869, observed at Port Saïd.
By G. L. Tupman, Esq.

On the morning of the 8th November, while observing shooting stars, I suspected radiation from the constellation of *Leo*. The following night was too cloudy for any observations whatever to be made.

On the 9th, between $12^h\ 45^m$ and $15^h\ 45^m$, radiation from *Leo* was observed at the rate of 8 per hour, principally small meteors. At the same time the radiation from two radiants in *Taurus* was at the rate of 12 per hour.

On the 10th, between 13^h and 16^h, the radiation from *Leo* was at the rate of about 6 per hour, and from *Taurus* about 7 per hour.

On the 11th, from $12^h\ 50^m$ to $15^h\ 10^m$, there was no radiation whatever from *Leo*, or indeed from any other point, although during that time shooting stars were observed at the rate of 16 per hour.

I am, as yet, unable to determine the radiant point in *Leo*, on the 9th and 10th, so that it is impossible to say if the meteors mentioned belonged to the true November system or not. Probably not.

On the 12th, out of thirteen observed meteors, four certainly radiated from near γ *Leonis*. One at $14^h\ 50^m$ passed exactly over the stars μ and α *Ursæ Majoris*, leaving a dazzling streak midway between those stars. This number reduced to the zenith would give about 5 per hour for a single observer.

On the 13th, a very strong breeze was blowing from the northward, accompanied by heavy clouds, which occasionally nearly altogether obscured the heavens. Above the lower cloud stratum was a thick haze which prevented the smaller stars being seen.

From $12^h\ 30^m$ to $13^h\ 15^m$, a pretty large patch being clear overhead, two meteors only were seen, neither of which radiated from *Leo*. It then became overcast, and I felt convinced that the shower was either all over or had not yet commenced.

The watch was resumed at $14^h\ 30^m$, the sky being then partly clear in patches, and continued until a quarter past 5, long before which the shower had entirely ceased. At $2^h\ 30^m$ it was at its height, most of the meteors being remarkably brilliant, and many of them tinted green. The greater part left bright streaks, which often remained visible a considerable time. The duration of the meteors or their "time of flight" was considered to be less than half a second—too short a time to estimate even roughly.

The following are the observations. Being unassisted, I stopped at every sixteenth to make the necessary entries:—

13 November, 1869, Alexandria Mean Time.

From h m	To h m	No. of Meteors.	Elevation of the Radiant. °
10 40·0	13 15·0	0	15
14 30·0	14 40·0	16	35
14 52·0	15 2·5	16	40
15 8·0	15 19·7	16	43
15 24·0	15 33·6	16	46
15 38·5	15 52·5	16	50
15 59·0	16 7·4	16	54
16 12·0	16 24·0	16	57
16 26·0	16 38·0	6*	60
16 40·0	16 52·0	7	63
16 54·0	17 14·0	4	67

Seven other meteors were observed, but they did not radiate from *Leo*.

If the numbers in the above table be reduced to an uniform

* During this observation it was more cloudy than before, but during the two following ones it was much clearer.

interval of time and then multiplied by the cosecant of the altitude of the radiant, it will be seen that between $14^h\ 30^m$ and $16^h\ 24^m$ the numbers were nearly uniform, and slightly decreasing. The maximum, then, was either before or about $14^h 30^m$; but the *centre* of the dense part must have been passed about 15 hours, as there was no sign of the shower at $13^h\ 15^m$.

For the determination of the Radiant point, eleven orbits were marked off on the chart, which appeared so close to the radiant as to give its position much more accurately than a host of orbits further off. The following table is a list of these orbits. The right ascensions and declinations are measured from the equinox of 1830, and, consequently, the resulting radiant point requires correcting for 39 years precession. Those of the first order of merit are more valuable than the others:

No.	Appearance.		Disappearance.		Order of Merit.
	α	δ	α	δ	
	°	°	°	°	
1	$151\frac{1}{2}$	+30	152	+42	2
2	$154\frac{1}{2}$	$+21\frac{1}{4}$	158	$+21\frac{1}{4}$	1
3	161	$+20\frac{3}{4}$	172	$+19\frac{3}{4}$	2
4	$152\frac{1}{2}$	$+19\frac{1}{4}$	157	$+16\frac{3}{4}$	2
5	150	$+19\frac{1}{2}$	$149\frac{1}{4}$	+14	1
6	$149\frac{1}{4}$	+19	$147\frac{1}{2}$	$+14\frac{1}{2}$	1
7	140	0	144	−12	2
8	130	+ 7	117	− 3	2
9	112	$+5\frac{1}{2}$	84	$-8\frac{1}{2}$	1
10	143	$+19\frac{1}{2}$	136	+16	2
11	140	$+19\frac{1}{2}$	127	$+17\frac{1}{2}$	2

These give the Radiant $\alpha = 151°{\cdot}0$, $\delta = 21°{\cdot}5$, measured from the equinox of 1869. But it must be noticed that no single point will satisfy all the paths that were observed, which proves that their orbits cannot be identical in inclination and eccentricity.

Three of the meteors deserve special notice.

The first occurred at $15^h\ 32^m$ near θ *Hydræ*. After describing an arc of 10° or 12°, almost instantaneously it exploded with a blaze of light that illuminated the whole sky, and was mistaken for lightning. At the point of explosion, a small luminous cloud was formed, about a degree and a half in diameter, of the shape of a nearly closed horseshoe, the interior diameter being about one-third the exterior. Its whole light was about equal to that of a first magnitude star, or of the nebula in *Lyræ*, seen in a large telescope. During the two or three minutes that attention was paid to it, it did not sensibly diminish its lustre or alter its place, which was $\alpha = 141°$, $\delta = +4°$.

The second occurred at $15^h\ 40^m$ in *Ursa Major*. It lighted up everything around as a brilliant flash of green lightning, and left an exceedingly bright streak some 8° in length, the centre of

which was in $\alpha = 131°$, $\delta = +55°$. After about a minute, this streak assumed a beautiful wavy appearance ~~~~, and two or three minutes after one of the shape of an S, the axis of which was inclined to the original axis about 70°. Five minutes after its first appearance it had drifted over the star *o Ursæ*, and was still pretty bright when it was obscured by clouds.

The third was very bright, of a greenish hue, and exploded like the first, but behind thin cloud, which did not prevent its illuminating all around. Unfortunately, its position could not afterwards be identified.

On the 14th, from $14^h\,30^m$ to $15^h\,20^m$, about a third of the sky being very clear, five small shooting stars only were seen, radiating from *Orion*.

The thickness of the dense part of the stream must have been about 52,000 miles, measured perpendicularly to the plane of the orbit. It may only have been one aggregation among many, and may not have been situated centrally in the stream.

From these observations the elements of the orbit are

$$\pi = 62^\circ\,36'$$
$$i = 15\;38$$
$$\Omega = 231\;44$$
$$\epsilon = \cdot 9062$$

Motion retrograde.

Assuming a periodic time of $33\frac{1}{4}$ years.

Port Saïd, Lower Egypt,
16 *November*, 1869.

The Assistant-Secretary, Mr. Williams, read some extracts from the introductory remarks to the MS. work presented to the Society by him at the last meeting, being a translation of the accounts of comets observed in China from B.C. 613 to A.D. 1640, with the original text, of which introductory remarks the following is a brief abstract:—

According to Chinese tradition the Emperor Shin Nung, the successor of Fuh He, the founder of the empire, was the first who instituted astronomical observations. His reign commenced B.C. 3218. One of his successors, Hwang Te, is reputed to have been the monarch who established the mode of reckoning their chronology by cycles of 60 years, in use to the present day. The first of these cycles commenced B.C. 2637. He is also said to have discovered the lunar cycle of 19 years, by which the intercalary moons were to be regulated, from which it should appear that this cycle was known to the Chinese about 2000 years before it was introduced into Greek astronomy by Meton. These, however, must be looked upon merely as Chinese traditions, having no other authority.